

NON-PUBLIC?: N
ACCESSION #: 9302110346
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Millstone Nuclear Power Station Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000336

TITLE: Manual Reactor Trip Due to Plant Conditions Resulting
From a Rupture in the Reheater Drain Tank to High
Pressure Feedwater Heater Pipe
EVENT DATE: 11/06/91 LER #: 91-012-01 REPORT DATE: 01/28/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Peter Anastas, Ext. 6066 TELEPHONE: (203) 447-1791

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: SN COMPONENT: PSF MANUFACTURER:
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On November 6, 1991, with the plant operating at 100% power, an eight inch diameter pipe ruptured at approximately 0643. The subject line contains pressurized, heated water and serves as a drain line from the first stage reheater drain tank no. 1B to the 1B high pressure feedwater heater. The water in this line is normally 470 psig at 463 degrees F. The leak released steam into the turbine building. The control room received a call that there was a "loud noise" in the turbine building. This initiated a review of control room instrumentation which indicated: Moisture separator reheater changes, slight cooldown, slight MWe output decrease and a 15 second calorimetric increase to 2722 MWth. A visual inspection of the turbine building confirmed the steam leak. At 0649 the SCO ordered a manual reactor trip based on alarms and indications. The reactor and turbine were tripped. The shift carried out EOP 2525, "Standard Post Trip Actions." Approximately one minute after the trip the

SS ordered the main steam isolation valves shut and the opening of the condenser dump valves to depressurize the main steam header. After EOP 2525 was completed, and in-hand verified, the shift entered EOP 2536, "Excess Steam Demand." In order to assess the source of the leak, the remaining condensate pump was secured and condenser vacuum was broken. With the plant stable the operators exited EOP 2526 "Reactor Trip Recovery."

END OF ABSTRACT

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I. Description of Event

On November 6, 1991, with the unit operating at 100% power, an eight inch diameter pipe ruptured at approximately 0643. The subject line contains pressurized, heated water and serves as a drain line from the first stage reheater drain tank no. 1B to the 1B high pressure feedwater heater (See Figure 1). The water in this line is normal, 470 psig at 463 degrees F. The loss of pressure due to the rupture caused the water to immediately flash, releasing steam into the turbine building. The control room received a call that there was a "loud noise" in the turbine building. This initiated a review of control room instrumentation which indicated: Moisture separator reheater changes slight cooldown, slight MWe output decrease and a 15 second calorimetric increase to 2722 MWth. A visual inspection of the turbine building confirmed the steam leak. By 0649 numerous alarms had activated in the control room. These alarms included: annunciator ground, 125 VDC bus 201D ground, main generator field ground, fire system, turbine hydrogen seal oil, field amps increasing, exciter field breaker trip and ground, "A" condenser pit sump high level, core monitor and other alarms on control boards C07 and C08. At this time the SCO ordered a manual reactor trip based on the alarms and indications. The reactor and turbine were tripped. The shift carried out EOP 2525, "Standard Post Trip Actions." Approximately one minute after the trip the SS ordered the main steam isolation valves shut and the opening of the condenser dump valves to depressurize the main steam header. After EOP 2525 was completed, and in-hand verified, the shift entered EOP 2536, "Excess Steam Demand." In order to assess the source of the leak, the remaining condensate pump was secured and condenser vacuum was broken. With the plant stable the operators exited EOP 2536 and entered EOP 2526, "Reactor Trip Recovery."

II. Cause of Event

The cause of the manual reactor trip was operator action in response to the alarms and indications following the rupture of the first stage reheater drain tank no. 1B to the high pressure feedwater heater line. The cause of this rupture was severe wall thinning to the extent that the component could no longer sustain the normal operating pressure. The system conditions and piping configuration rendered the component susceptible to wear (wall thinning) from two-phase erosion/corrosion, cavitation or a combination of both mechanisms. Therefore, the effective root cause of the incident was the compounding effects of a high velocity two-phase fluid stream, a susceptible material and a non-optimal system geometry that induced high flow turbulence.

III. Analysis of Event

This report is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv), "Any event or condition that resulted in the manual or automatic actuation of any Engineered Safety Feature (ESF), including the reactor Protection System (RPS)." There were no safety consequences resulting from this event since normal post trip procedures were followed, and all safety equipment operated as expected.

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IV. Corrective Action

During the shutdown an investigation was performed of the turbine building components and structures that may have been affected by the ruptured pipe. The ruptured pipe was replaced. Any other affected components/structures have been assessed and rectified per standard plant procedures. To prevent a recurrence, the plant pipe inspection program has been expanded to incorporate increased inspections utilizing industry experience and the EPRI CHECMATE program of the following systems: feedwater, condensate, blowdown, main steam, heater drains, extraction steam, seal steam, and auxiliary steam. This enhanced program has resulted in over 400 additional items being inspected. Prior to plant startup, all inspection results were reviewed and a determination of the required plant action (i.e., repair, replace, or monitor, etc.) was made and implemented. In addition, a multi-disciplined engineering task force was formed to investigate the root cause of this event. Their conclusions have been incorporated into this report. This group provided recommendations which have led to an enhanced erosion/corrosion program. The enhanced program primarily reflects

expansion to encompass additional areas which consider; geometry effects, chemical effects, industry experience and a reassessment of the use of existing exclusion criteria. This program is formally documented and controlled by a Corporate "Erosion/Corrosion Program Manual." This enhanced program was utilized during the 1992 extended outage.

V. Additional Information

Similar LERS: None

EIIS Codes:

SN TK M370 (First Stage Reheater Drain Tank No. 1B)

SB MSR S290 (Moisture Separator Reheater)

SJ HX S290 (High Pressure Feedwater Heater No. 1B)

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Figure 1 "Piping Configuration" omitted.

ATTACHMENT 1 TO 9302110346 PAGE 1 OF 1

NORTHEAST UTILITIES

NU The Connecticut Light And Power Company

Western Massachusetts Electric Company

Holyoke Water Power Company

Northeast Utilities Service Company

Northeast Nuclear Energy Company

General Offices o Selden Street o Berlin Connecticut

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January 28, 1993

MP-93-105

Re: 10CFR50.73(a)(2)(iv)

U.S. Nuclear Regulatory Commission

Document Control Desk

Washington, D.C. 20555

Reference: Facility Operating License No. DPR-65
Docket No. 50-336
Licensee Event Report 91-012-01

Gentlemen:

This letter forwards update Licensee Event Report 91-012-01 required to be submitted pursuant to 10CFR50.73(a)(2)(iv).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Stephen E. Scace
Director, Millstone Station

SES/HB:ljs

Attachment: LER 91-012-01

cc: T. T. Martin, Region I Administrator
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2
and 3
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

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